M/045/004

jbr CONSULTANTS GROUP

GEOLOGY ENGINEERING ENVIRONMENT HYDROLOGY

May 31, 1986

Mr. Rick Sommers
Hydrologist
Division of Oil, Gas & Mining
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

Dear Rick:

In response to our meeting of May 29, 1986 to discuss the Anaconda Carr Fork Reclamation/Stabilization Plan we have performed the following analyses of the Upper Dry Creek drainage works.

1. The hydraulics of reach F were checked using the methods contained in "Applied Hydrology and Sedimentology for Disturbed Areas" by Barfield, Warner and Haan. The channel was first checked for design velocity using vegetation with a Retardance Class of C and an assumed Mannings N of 0.03. The results of the calculations are attached and show that the design velocity is 3.14 fps against an allowable velocity of 5 fps. The calculated N value for this flow regime is 0.066. This indicates that the channel should perform adequately as designed.

To check on the performance of this channel prior to the vegetation becoming established we checked the velocity using a Mannings N of 0.035 for bare earth. The results of this run are also attached and show that the velocity would be 4.6 fps against an allowable velocity of 5 fps. This indicates that the channel should perform adequately in the event that the vegetation does not become established.

2. To determine the required flow value for the annual subchannel that you recommended be installed in Reach F we used the same methods as before (SCS Curve Number) to calculate the peak flow from events with small recurrance intervals and 6-hour durations. We found that the 5yr-6hr event produced a peak flow of 7 cfs and that the 2yr-6hr event did not produce runoff. We feel that use of the 5yr event is a reasonable assumption for the design of the annual flow channel because the vegetative lining should be well established within that time period.

We used the methods in Barfield, Warner and Haan to calculate the dimensions of a triangular channel to be placed on the center line of Reach F. The results of this calculation are attached and show that an earth-lined channel with 5h:1v slopes and 1 foot deep will suffice. The construction drawings will be modified to show this design.

Principal Office:
1841 East Fort Union Blvd.
Salt Lake City, Utah 84121
1-801-943-4144

Cedar City Office:
865 South Cedar Knolls West
Cedar City, Utah 84720
1-801-586-8793

3. We recalculated the flow conditions in Reach D using 18-inch D50 rip rap. The Mannings N for this lining was calculated according to the method of Norman, 1975, ($N=0.0395\ D50^{0}.1666$). The results of the calculations are attached. The calculated velocity for the 100 yr event is 9.6 fps which is less than the allowable velocity for this size rock (12-14 fps). This design will be shown in the modified construction drawings.

4. We checked the flow conditions in Reach B using a Mannings N value of 0.04 for the 12-inch D50 rip rap lining. The results of this calculation are attached. The calculated velocity for the 100 yr event is 8.9 fps which is less than the allowable velocity for this size rock (10-12 fps). This design appears to be satisfactory as is.

Design drawings for construction of the Dry Creek drainage works will be submitted to the Division within 30 days of completion of the drawings. We anticipate that this submission would occur in mid-July, 1986.

We will appreciate your facilitating the approval of the Reclamation Plan by the Division as this item is now behind schedule.

Sincerely,

Brian

Brian W. Buck
Vice President

cc. C. Lin
R. Dent

attachments

VEGCHAN DESIGNS A VEGETATED CHANNEL BASED ON PROCEDURES IN

APPLIED HYDROLOGY AND SEDIMENTOLOGY
FOR DISTURBED AREAS
BY BARFIELD, WARNER, AND HAAN

AVAILABLE FROM

OKLAHOMA TECHNICAL PRESS
815 HILLCREST
STILLWATER, OK 74074

TRAPEZOIDAL CHANNEL Reach F, Vegetated

CHANNEL CAPACITY = 81.66932 CFS
DESIGN VELOCITY = 3.139961 FPS
CHANNEL SLOPE = 5 %
MANNINGS N = .066442
RETARDANCE CLASS(ES) USED C
DESIGN FLOW DEPTH = .5048979 FEET
DESIGN FREEBOARD = .4 FEET
TOTAL CHANNEL DEPTH = .9048979 FEET
CHANNEL TOP WIDTH = 55.42939 FEET
CHANNEL SIDE SLOPE = 3 TO 1
DESIGN BOTTOM WIDTH = 50 FEET

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TRAPEZOIDAL CHANNEL Reach F, non-vegetated

CHANNEL CAPACITY = 81.43208 CFS
DESIGN VELOCITY = 4.61706 FPS
DESIGN TRACTIVE FORCE = 1.054469 PSF
CHANNEL SLOPE = 5 %
MANNINGS N = .035
DESIGN FLOW DEPTH = .3455788 FEET
DESIGN FREEBOARD = .4 FEET
TOTAL CHANNEL DEPTH = .7455788 FEET
CHANNEL TOP WIDTH = 54.47348 FEET
CHANNEL SIDE SLOPE = 3 TO 1
DESIGN BOTTOM WIDTH = 50 FEET

TRIANGULAR CHANNEL Reach F, Annual Flow Channel

CHANNEL CAPACITY = 6.993076 CFS
DESIGN VELOCITY = 4.802789 FPS
DESIGN TRACTIVE FORCE = 1.238231 PSF
CHANNEL SLOPE = 7.5 %
MANNINGS N = .035
DESIGN FLOW DEPTH = .5396378 FEET
DESIGN FREEBOARD = .4 FEET
TOTAL CHANNEL DEPTH = .9396378 FEET
CHANNEL TOP WIDTH = 5.396378 FEET
CHANNEL SIDE SLOPE = 5 TO 1

TRAPEZOIDAL CHANNEL Reach D, 18" Rip Rap

CHANNEL CAPACITY = 81.71426 CFS
DESIGN VELOCITY = 9.578009 FPS
DESIGN TRACTIVE FORCE = 5.257411 PSF
CHANNEL SLOPE = 13 %
MANNINGS N = .042
DESIGN FLOW DEPTH = .8164558 FEET
DESIGN FREEBOARD = .4 FEET
TOTAL CHANNEL DEPTH = 1.216456 FEET
CHANNEL TOP WIDTH = 15.29874 FEET
CHANNEL SIDE SLOPE = 3 TO 1
DESIGN BOTTOM WIDTH = 8 FEET

TRAPEZOIDAL CHANNEL Reach B, 12" Rip Rap

CHANNEL CAPACITY = 81.79893 CFS
DESIGN VELOCITY = 8.926299 FPS
DESIGN TRACTIVE FORCE = 4.075246 PSF
CHANNEL SLOPE = 9.600001 %
MANNINGS N = .04
DESIGN FLOW DEPTH = .8649346 FEET
DESIGN FREEBOARD = .4 FEET
TOTAL CHANNEL DEPTH = 1.264935 FEET
CHANNEL TOP WIDTH = 15.58961 FEET
CHANNEL SIDE SLOPE = 3 TO 1
DESIGN BOTTOM WIDTH = 8 FEET